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Applicant : King Jien Chui
Reply to the Office action dated April 5, 2006

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2 **Remarks/Arguments**

3 Examiner Ms. Joannie Garcia is thanked for the thorough Office
4 Action.

5

6 **In the Claims**

7 Parent claim 1 has been amended: to add – at least a portion
8 of – before “the doped depletion” at line 10 of claim 1; and to add – directly –
9 before “beneath” at line 11 of claim 1. No new matter has been entered. For
10 support, please see Fig. 3A, for example. Applicants urge that the addition of “at
11 least a portion of” broadens claim 1. Applicants urge that the addition of “directly”
12 simply makes explicit what was implicit in view of the specification and drawings
13 as filed and does not narrow claim 1.

14 Parent claim 1 has been amended to add – and – after
15 subparagraph b). This amendment corrects an inadvertent editorial error and is
16 not believed to narrow the scope of claim 1.

17 Claim 2 is amended. For support see fig 3A. See Spec. p. 14.

18 Claim 4 has been amended to replace “region” with – regions –
19 as requested by the Examiner to overcome the Objection to claim 4. This
20 amendment is not believed to narrow the scope of claim 4.

21 Claim 7 has been amended to: delete the slash (/) between the
22 words “source” and “drain” and replace it with the word – and – at line 2 of claim
23 7 for clarity. These amendments are not believed to narrow the scope of claim 7.

24 Claim 9 is amended to add “the doped depletion regions are
25 directly beneath and separated from said LDD regions.”. for support see Figure
26 2A and 2B.

27

28

29 Claim 21 has further been amended by replacing “implant” with

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1 -- implantation -- as requested by the Examiner to overcome the objection to
2 claim 21. This amendment is not believed to narrow the scope of claim 21.

3 Parent claim 23 has been amended in the manner requested by
4 the Examiner to overcome the objections to claim 23. Further: the slash (/) has
5 been removed between the words "source" and "drain" and replace with -- and --
6 at line 7 of claim 23 for clarity; and the word -- and -- has been added before step
7 c) as an editorial amendment. These amendments are not believed to narrow the
8 scope of claim 23.

9 Claim 25 has been amended to: delete the slash (/) between the
10 words "source" and "drain" and replace with -- and -- at line 2 of claim 25 for
11 clarity; and add -- about -- after "between" at each instance. These amendments
12 are not believed to narrow the scope of claim 25.

13 Claim 38 has been amended to add -- and -- after line 3. This
14 amendment is not believed to narrow the scope of claim 38.

15 **New claims**

16 Claims 41 to 43 are new and have been added to better
17 encompass the full scope and breadth of the invention notwithstanding the
18 patentability of the original claims.

19 Claim 41 depends from independent claim 1.

20 Claim 42 depends from independent claim 23.

21 Claim 43 is an independent claim and comprises the limitations
22 of independent claim 1 and allowable claim 9 (thus claim 43 is now allowable).

23

24 No new matter has been added in any of the above claim
25 amendments and in no case do these amendments narrow the scope of the
26 respective claims and they do not invoke FESTO related amendments.

27

28 **Objection to the claims for Informalities**

29 The claims are amended to correct the informalities kindly point
30 out the examiner.

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2 **CLAIM REJECTIONS:**

3

4 **Rejection Of Claims 1, 2, 7, 8 and 14 Under 35 U.S.C. § 102(b) as being**
5 **anticipated by Burr (US Patent Publication 2003/0178698 A1)**

6

7 The rejection of claims 1, 2, 7, 8 and 14 under 35 U.S.C. §
8 102(b) as being anticipated by Burr (US Patent Publication 2003/0178698 A1)
9 (the '698 Burr Publication) is acknowledged. Reconsideration and withdraw is
10 respectfully requested in view of the amendments.

11 Applicant urges that amended Parent claim 1 is allowable for
12 the following reasons.

13 **Parent Claim 1 is allowable**

14 Amended Claim 1 is not anticipated *nor obvious* in view of Burr
15 because Burr does not disclose or fairly teach claim 1's limitations of, *inter alia*:

16
17 **at least a portion of the doped depletion regions are directly**
18 **beneath and separated from said source and drain regions;**
19

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1 Parent claim 1 states:

1. (CURRENTLY AMENDED) A method of forming a semiconductor device comprising:

- a) forming a gate structure over a substrate being doped with a first conductivity type impurity;
- b) performing a doped depletion region implantation by implanting ions being a second conductive type into the substrate to form doped depletion regions; and
- c) performing a S/D implantation by implanting ions being the second conductivity type into the substrate to form source and drain regions adjacent to said gate structure; **at least a portion of the doped depletion regions are directly beneath and separated from said source and drain regions;**
 - (1) said doped depletion regions having an impurity concentration and thickness so that said doped depletion regions are depleted due to a built-in potential created between said doped depletion regions and said substrate;
 - said doped depletion regions having an impurity concentration so that a built-in junction potential between said doped depletion regions and said substrate forms depletion regions in the substrate between the source and drain regions and the doped depletion regions;
 - said depletion regions have a net impurity concentration of the first conductivity type.

2

3

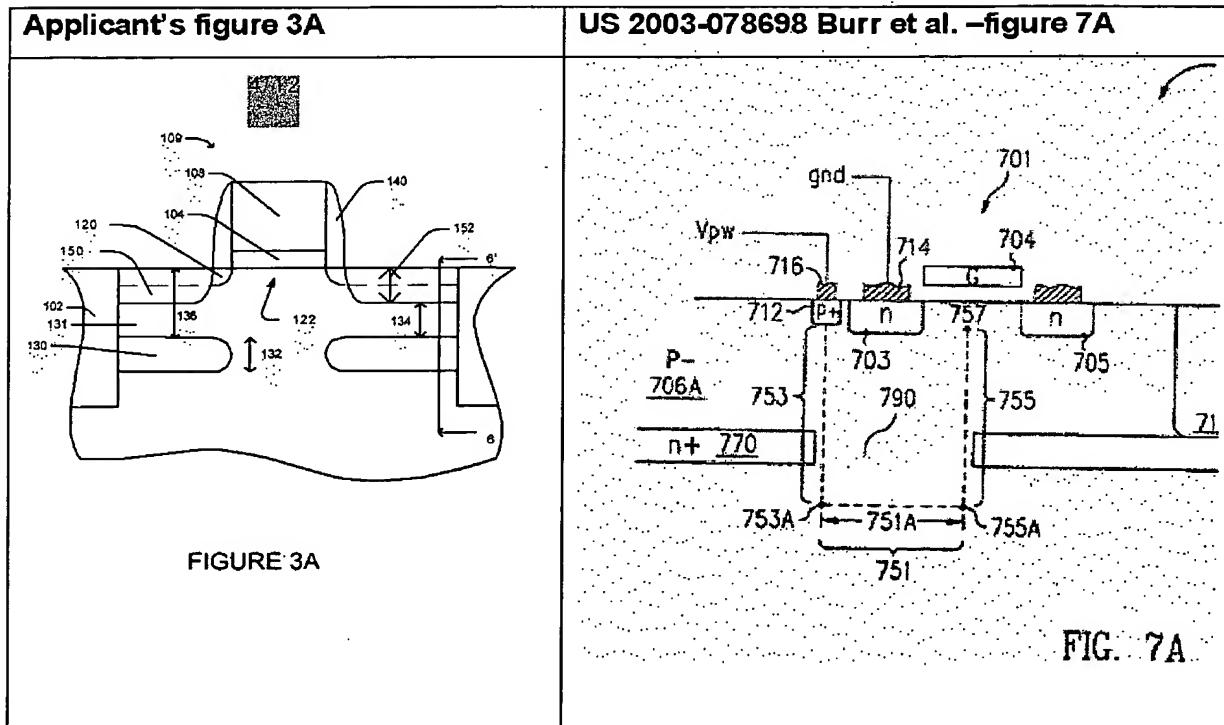
4 Applicants repeat their previous relevant arguments as to the
5 '698 Burr Patent Publication as to amended claim 1 and further, Parent claim 1
6 includes the limitation, *inter alia*, "**at least a portion of the doped depletion**
7 **regions are directly beneath and separated from said source and drain**
8 **regions;**". This limitation is not shown or fairly described in Burr as evidenced by
9 Table A showing Applicant's figure 3A and Burr's figure 7A:

10

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1 Table A



2

3

4 Thus Fig. 3A shows that at least a portion of the doped
5 depletion regions 130 are directly beneath and separated from said source
6 region 150 and said drain region 150. In contrast, Burr figure 7A shows that no
7 **portion of perforated Buried N-well (N+)** 770 is **directly beneath both the**
8 **source and drain regions 703 and 705**. Burr figure 7A clearly shows there is no
9 perforated Buried N-well (N+) 770 beneath the source/drain region 703. In fact, in
10 Figure 7A, Burr teaches away from this limitation by showing only the substrate
11 (not buried N+ well 770) beneath the source/drain 703. See Figure 7A; See Burr
12 para 164. A Key to Burr's invention is the opening below the S/D that provide a
13 longer resistance page. See Burr Abstract, col. para 164.

14

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1 The instant office action posits the follow:

2 performing a doped depletion implantation region by implanting ions being a
3 second conductivity type to the substrate to form doped depletion regions 770
4 beneath and separated from source/drain regions 703 705 (Figure 7 A and
5 Paragraphs 0161, and 0164),
6

7 However, as shown above in amended claim 1 and table A, Burr
8 (Figure 7 A and Paragraphs 0161, and 0164) do not teach applicant's claimed
9 doped depletion regions 130 are directly beneath and separated from said
10 source region 150 and said drain region 150. Moreover, Burr teaches a different
11 method to form the buried N+ well 770. As noted above there is no motivation to
12 change Burr since a key to Burr's invention is the opening below the S/D that
13 provide a longer resistance page. See Burr Abstract, col. para 164. Furthermore
14 there is no motivation to modify Burr to meet applicant's claim 1 since Burr solves
15 a different problem than the invention.

16
17 Therefore claim 1 is allowable.
18

19 **Amended Claim 2 is non-obvious**

20 Amended claim 2 states:

21
22 2. (CURRENTLY AMENDED) The method of claim 1 wherein said doped
depletion regions are not formed directly under said gate structure.

23 As discussed above, Burr teaches against this limitation. In
24 contrast to claim 2, Burr fig. 7A forms buried N+ well 770 directly under the gate.

25 Claims 2, 7, 8 and 14 depend from claim 1 and therefore they
26 are also allowable.

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2 **Rejection of claims 12, 13, 15, 18 to 21 and 23 to 25 under 35 U.S.C. § 103(a)**
3 **as being unpatentable over Burr (US Patent Publication 2003/0178698 A1)**
4 **as applied to claims 1, 2, 7, 8 and 14 above and further in view of Bae et al.**
5 **al (US Patent Publication 2004/0075143 A1).**

6

7 The rejection of claims 12, 13, 15, 18 to 21 and 23 to 25 under
8 35 U.S.C. § 103(a) as being unpatentable over Burr (US Patent Publication
9 2003/0178698 A1) (the '698 Burr Publication) as applied to claims 1, 2, 7, 8 and
10 14 above and further in view of Bae et al. al (US Patent Publication
11 2004/0075143 A1) (the '143 Bae Publication) is acknowledged. Reconsideration
12 and withdrawal of the rejection is respectfully requested in view of the
13 amendments.

14

15 **Claims 12 13 15 and 18 to 21 depend from amended parent claim 1**

16

17 Claims 12 13 15 and 18 to 21 depend from amended parent
18 claim 1 are should be allowable for the reasons discussed above under the
19 102(b) rejection of claims 1, 2, 7, 8 and 14.

20

21 This amendment is not a concession that the previous versions
22 of claims are not allowable. This amendment made to accelerate the allowance
23 of claims. Applicant still maintains that previous claim 1 and it's depend claims
24 are allowable for the reasons stated in the previous responses to office actions.

25

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1 **Parent Claim 23 is allowable**

2 Parent claim 23 states:

23. (CURRENTLY AMENDED) A method of forming a semiconductor device comprising:

- a) forming a gate structure over a substrate being doped with a first conductivity type impurity;
- b) performing a doped depletion region implantation by implanting ions being a second conductivity type to the substrate to form doped depletion regions beneath and separated from said source[] and drain regions;
 - (1) said doped depletion regions have an impurity concentration and thickness so that said doped depletion regions are depleted due to a built-in potential created between said doped depletion regions and said substrate; and
- c) performing a S/D implantation by implanting ions being the second conductivity type into the substrate to form said source and drain regions adjacent to said gate structure;
 - (1) said substrate between said source and drain regions and said doped depletion regions has a concentration of a first type impurity between 1E16 to 1E18 atom/cc;
said doped depletion regions have an impurity concentration so that the built-in potential between said doped depletion regions and said substrate forms depletion regions in the substrate between the source and drain regions and the doped depletion region regions; said depletion regions have a net impurity concentration of the first conductivity type; said depletion regions have a net impurity concentration between 1E16 to 1E18 atom/cc.

3

4

5 Parent claim 23 contains at least the subject matter limitations
6 of claim 1 (without the addition of – at least a portion of – and – directly – added
7 in the instant Response) **and the limitations of allowable claim 4 (bolded**
8 **above).**

9

10 Therefore claim 23 is allowable.

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2 Dependent Claims 24 to 27 are allowable

3 Dependent claims 24 to 27 depend from claim 23 which, by the
4 Examiner's statement of allowability of dependent claim 4 and Applicants'
5 arguments above, is allowable and hence claims 24 to 27 are allowable.

6

7 Dependent Claims 24 is (further) allowable

8 Dependent Claim 24 is (further) allowable because it includes
9 the limitation "wherein said doped depletion regions are not formed under said
10 gate structure." See Table A above which clearly demonstrates that Burr lacks
11 this limitation and the '143 Bae Patent Publication does not cure this shortcoming
12 under 103(a). Also, because of the reasons given in the previous office action.

13

14 Thus claims 12, 13, 15, 18 to 21 and 23 to 25 are patentably
15 distinguishable under 35 U.S.C. § 103(a) over Burr as applied to claims 1, 2, 7, 8
16 and 14 above, and further in view of Bae for the above reasoning/arguments and
17 further because, *inter alia*: the prior art lack a suggestion that the reference
18 should be modified in a manner required to meet the claims; Burr is a poor
19 reference; the Examiner misunderstood Burr; the invention is contrary to the
20 teaching of the prior art—that is, the invention goes against the grain of what the
21 prior art teaches; the Examiner has made a strained interpretation of the
22 reference that could be made only be hindsight; the Examiner has not presented
23 a convincing line of reasoning as to why the claimed subject matter as a whole,
24 including its differences over the prior art, would have been obvious; and the
25 reference takes a difference approach.

26

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1 **The combination of Burr and Bae is improper**

2

3 Yet further, the combination of Burr and Bae is improper for the
4 following reasons. Burr and Bae are unrelated, solve different problems, use
5 different solutions and have no process steps in common. The combination is
6 Unsuggested: The prior art references do not contain any suggestions (express
7 or implied) that they be combined, or that they be combined in the manner
8 suggested. The references are individually Complete: Each reference is
9 complete and functional in itself, so there would be no reason to use parts from
10 or add or substitute parts to any reference.

11 Therefore combination is improper.

12

13 Even if combined, the references do not meet or suggest the
14 applicant's claims.

15

16 The dependent claims depend from non-obvious parent claims
17 and are therefore non-obvious. As described above, the parent claims are non-
18 obvious over the references.

19

20 **NEW CLAIMS**

21 **New claim 41 is non-obvious.**

22 Claim 41 states:

23 41. (NEW) The method of claim 1, further comprising a channel region in
24 said substrate under said gate structure; wherein said heavily
25 doped depletion regions are not directly beneath said channel
26 region.

27 As discussed above, Burr teaches against claim 41.

28

29 **Claim 42 is non-obvious**

30

31 Claim 42 depends from independent claim 23.

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1 42. (NEW) The method of claim 23, wherein at least a portion of the doped
2 depletion regions are directly beneath and separated from said
3 source and drain regions.

4
5 Burr teaches against having depletion regions under both the
6 source and drain. See Burr fig. 7A.

7

8 Claim 43 is allowable

9 Claim 43 is an independent claim and comprises the limitations
10 of independent claim 1 and allowable claim 9 (thus claim 43 is now allowable).

11

12

13 **ALLOWABLE SUBJECT MATTER**

14

15 The allowance of claims 38 to 40 is gratefully acknowledged.

16

17 The objection to claims 4* to 6, 9 to 11, 16, 17, 22, 26, 27 and
18 37 as being dependent upon a rejected base claims, but allowable if rewritten in
19 independent form is gratefully acknowledged. [*Please see the argument above
20 for the allowability of independent claim 23 as it now includes, *inter alia*, the
21 limitations of claim 1 and claim 4.]

22

23 Applicant requests that the rewriting of objected to claims 4, 9 to
24 11, 16, 17 and 22 be held in abeyance pending the final determination of the
25 allowability of their parent claim 1. Applicant requests that the rewriting of
26 objected to claims 26 and 37 be held in abeyance pending the final determination
27 of the allowability of their parent claim 23.

28

29 **CONCLUSION**

30

31 It is believed that all the pending claims have been addressed.
32 However, the absence of a reply to a specific rejection, issue or comment does

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1 not signify agreement with or concession of that rejection, issue or comment. In
2 addition, because the arguments made above may not be exhaustive, there may
3 be reasons for patentability of any or all pending claims (or other claims) that
4 have not bee expressed. Finally, nothing in this paper should be construed as an
5 intent to concede any issue with regard to any claim, except as specifically stated
6 in this paper. and the amendment of any claim does not necessarily signify
7 concession of the unpatentability of the claim prior to its amendment.

8 In conclusion, reconsideration and withdrawal of the rejections
9 are respectfully requested. Allowance of all claims is requested. Issuance of the
10 application is requested.

11 It is requested that the Examiner telephone the undersigned
12 attorney at (215) 670-2455 should there be anyway that we could help to place
13 this Application in condition for Allowance.

14

15 **Charge to Deposit Account**

16

17 The Commissioner is hereby authorized to apply any fees or
18 credits in this case, which are not already covered by check or credit card, to
19 Deposit Account No. 502018 referencing this attorney docket. The Commissioner
20 is also authorized to charge any additional fee under 37 CFR §1.16 and 1.17 to
21 this Deposit Account.

22

23 Respectfully submitted,

24 William J. Stoffel REG # 39,390/

25 William J. Stoffel date: 28 June 2006
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33

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